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# DEPARTMENT OF THE AIR FORCE

## SUPPORTING DATA FOR FISCAL YEAR 1988/89 BUDGET ESTIMATES

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## DESCRIPTIVE SUMMARIES

RESEARCH, DEVELOPMENT, TEST AND EVALUATION

AD-B109 541

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FY 1988/FY 1989 RDT&E DESCRIPTIVE SUMMARY

Program Element: 12433F  
DOD Mission Area: 332-Strategic Surveillance and Warning

Title: NUDET Detection System (NDS)  
Budget Activity: 3-Strategic Programs

1. (U) RDT&E RESOURCES (PROJECT LISTING): (\$ in thousands)

<u>Project Number</u>	<u>Title</u>	<u>FY 1986 Actual</u>	<u>FY 1987 Estimate</u>	<u>FY 1988 Estimate</u>	<u>FY 1989 Estimate</u>	<u>Additional to Completion</u>	<u>Total Estimated Cost</u>
TOTAL FOR PROGRAM ELEMENT		18,674	25,468	10,397	10,932	Continuing	N/A

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Strategic Air Command and Aerospace Defense Command require a highly survivable capability to detect, locate, and report any nuclear detonation (NUDET) on a global basis in near real time. The NUDET Detection System (NDS) (formally known as the Integrated Operational NUDET Detection System (IONDS)) consists of sensors on the operational 18-satellite Navstar Global Positioning System (GPS). NUDET information supports post-impact selection of appropriate retaliatory options in response to a nuclear attack against North America, as well as strike confirmation, and damage assessment. NUDET detection information is vital to the effective management of U.S. forces through the trans- and post-attack phases of a nuclear conflict. Reports to command centers of weapon effectiveness will be vital in managing strategic reserve forces and re-establishing a command structure. NDS data could be a major information component during negotiations to terminate a nuclear conflict.

3. (U) COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (\$ in thousands)

RDT&E	20,015	31,346	9,717	N/A	Continuing	N/A
Missile Procurement	22,299	26,325	N/A	N/A	Continuing	N/A
Other Procurement	0	11,630	N/A	N/A	Continuing	N/A

EXPLANATION: (U) The increase in FY 1988 funds the development of second sources of key satellite boxes to support the competitive development of NDS equipped GPS replenishment satellites and a user terminal reliability development and improvement program. The decrease in FY 1986 was due to Gramm-Rudman reductions. The decrease in FY 1987 was due to Congressional reductions relating to the delays caused by the Shuttle accident.

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4. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	FY 1986 Actual	FY 1987 Estimate	FY 1988 Estimate	FY 1989 Estimate	Additional to Completion	Total Estimated Cost
Missile Procurement						
Funds	20,499	9,338	11,900	0	Continuing	N/A
Quantities	9	8	4	0		
Other Procurement						
Funds	0	2,798	13,891	13,960	Continuing	N/A
Quantities	0	0	2	2		

5. RELATED ACTIVITIES: NDS sensors are flown on all Navstar Global Positioning System (GPS) satellites (PE 35165F) beginning with the GPS launch in July 1983. Development and production of the X-ray and optical Nuclear Detection (NUDET) sensors for NDS are funded by the Department of Energy (DOE), with support from [ ] The X-ray and optical sensors are integrated into the GPS satellite under PE 31357F. Production of the airborne NDS terminals, to begin in FY 1989, will be funded in the Worldwide Airborne Command Post, PEs 11312F and 32015F.

6. WORK PERFORMED BY: System development and procurement is accomplished by Air Force System Command's Space Division, Los Angeles AFB, CA [ ] Rockwell International, Seal Beach, CA, integrates the NDS sensors on GPS satellites and produces the Electromagnetic Pulse (EMP) sensor. Ford Aerospace and Communications Corporation, Palo Alto, CA, and the Aerospace Corporation, El Segundo, CA, provide systems engineering support. Sandia National Laboratories, Albuquerque, NM, and Los Alamos National Laboratory, Los Alamos, NM, are under contract to the Department of Energy (DOE) to produce the X-ray and optical nuclear detonation sensors. Texas Instruments, Dallas, TX, is developing and will produce the Ground/Airborne user terminals. E-Systems, Garland, TX, is developing the EMP receiver/processor for the satellite.

7. (U) PROJECTS LESS THAN \$10 MILLION IN FY 1988 AND/OR FY 1989: Not Applicable

8. (U) SINGLE PROJECT OVER \$10 MILLION IN FY 1988 AND/OR FY 1989:

(U) Project: 12433F, NUDET Detection System

A. Project Description: The NDS payload consists of X-ray, optical, and electromagnetic pulse (EMP) sensors on the operational eighteen satellite GPS constellation. These sensors, when coupled with the extremely precise GPS timing capability, will provide location of nuclear bursts worldwide [ ] This project develops and integrates the electromagnetic pulse sensor into the GPS satellite and develops the Ground/Airborne terminals to provide authorized users direct receipt of NDS nuclear detonation data. The data is also cross-linked to other GPS/NDS satellites which act as relay points. This cross-linking of information, when used with 18 satellites, will

Program Element: 12433F  
DOD Mission Area: 332-Strategic Surveillance and Warning

Title: NUDET Detection System (NDS)  
Budget Activity: 3-Strategic Programs

allow a user on one side of the earth to receive detonation data from the opposite side. It also provides multiple redundancy of the data transmission for increased system availability and survivability. A broad range of users (National Command Authorities, Strategic Air Command, Aerospace Defense Command, other Unified and Specified Commands, and the [ ] will receive nuclear detonation (NUDET) data direct from the spacecraft on the precise location, yield, count, time, and height of burst.

### 3. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1986 Accomplishments: NDS Payloads were installed on the final four validation phase Global Positioning System (GPS) spacecraft. The last development satellite was launched in October 1985. The electromagnetic pulse (EMP) sensor, along with the DOE developed sensor are being integrated onto the GPS spacecraft. EMP sensor tests continue. Problems found during the NDS user terminal Critical Design Review in late 1985 with antenna packaging and receiver software design were resolved. The NDS terminal design continued with initial testing on an engineering model antenna. Aircraft interface engineering began.

(2) (U) FY 1987 Program: The FY 1987 program will complete development and testing of the electromagnetic pulse (EMP) sensor. NDS user terminal development will continue. Mission software tests will be performed to reduce risks associated with terminal integration with ground fixed/mobile and airborne command posts. Engineering model tests will continue verifying software/hardware integration.

(3) FY 1988 Planned Program and Basis for FY 1988 RDT&E Request: Integration efforts for the EMP sensor and NDS payload will continue on the GPS production spacecraft. An effort will begin to develop second sources of key satellite components. These second sources will provide the industrial base to compete the NDS equipped GPS replenishment satellite production scheduled to start in FY 1991. The NDS user terminal development effort will continue. A NDS development terminal will be installed at [ ] in support of Development Test and Evaluation/Initial Operational Test and Evaluation (DT&E/IOT&E) testing. Procurement of user ground terminals for high priority users will be initiated. Aircraft integration engineering for the EC-135 aircraft NDS terminal will continue. A NDS terminal reliability improvement program will begin. Costs for the NDS satellite sensor payload are based on previous NDS satellite sensor payload development efforts and are category II, mature, estimates. NDS user terminal development costs are based on similar terminal developments and contract costs, and are category II, mature, estimates.

(4) FY 1989 Planned Program and Basis For FY 1989 RDT&E Request: Engineering development will begin on the NDS payload for the GPS replenishment satellites. A user terminal will be completing DT&E/IOT&E testing at [ ] Aircraft modification activities will begin to support the DT&E/IOT&E testing on the EC-135. Production activities will continue. The user terminal reliability program will continue. The same cost estimate categories apply as in FY 1988.

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Pr Element: 12433F  
on Area: 332-Strategic Surveillance and Warning

Title: NUDET Detection System (NDS)  
Budget Activity: 3-Strategic Programs

(5) (U) Program to Completion: This is a continuing program. NDS sensor design and production are keyed to the GPS satellite schedule. The user terminal development program will conclude in early 1990 and NDS user terminal production will continue satisfying ground and airborne terminal users. Outyear RDT&E funds will support the development of fixes for deficiencies found during DT&E/IOT&E and required system operational improvements.

C. (U) Major Milestones:

<u>Milestones</u>	<u>Dates</u>
(1) (U) Defense Systems Acquisition Review Council II	June 1979
(2) (U) Begin Satellite Production	August 1982
(3) (U) Launch 1st NDS Equipped Global Positioning System Spacecraft	July 1983
(4) (U) Launch 1st Operational Satellite	*(1st Quarter FY 1987) 1st Quarter FY 1989**
(5) (U) Start User Terminal Initial Operational Test and Evaluation (EC-135)	1st Quarter FY 1990
(6) (U) Achieve Worldwide 2-Dimensional NUDET Location Capability *(1st Quarter FY 1988)	4th Quarter FY 1989**
(7) (U) Achieve Worldwide 3-Dimensional NUDET Location Capability *(1st Quarter FY 1989)	4th Quarter FY 1990**

\* Date presented in the FY 1987 Descriptive Summary.  
\*\* Launch dates and NDS capabilities are based on the Delta II contractor's proposal and the current DOD launch manifest.

(U) Explanation of Milestone Changes

(4) (6) (7) (U) First launch of an operational satellite and NDS operational capabilities slipped because of 24 month Shuttle standdown.

3. (U) COOPERATIVE AGREEMENTS: Not Applicable

FY 1988/FY 1989 RDT&E DESCRIPTIVE SUMMARY

Program Element: 31357F  
 DOD Mission Area: 312 - General Defense Intelligence Programs

Title: NUDET Detection System (NDS)  
 Budget Activity: 5 - Intelligence Communications

1. RDT&E RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1986 Actual	FY 1987 Estimate	FY 1988 Estimate	FY 1989 Estimate	Additional to Completion	Total Estimated Cost
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TOTAL FOR PROGRAM ELEMENT

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Strategic Air Command and Aerospace Defense Command require a highly survivable capability to detect, locate, and report nuclear detonations (NUDETS) on a global basis near-realtime. The NUDET Detection System (NDS) (formally known as the Integrated Operational NUDET Detection System (IONDS) consists of sensors on the operational 18-satellite Navstar Global Positioning System (GPS). NUDET information supports post-impact selection of appropriate retaliatory options in response to a nuclear attack against North America as well as strike confirmation, and damage assessment. NUDET detection information is vital to the effective management of U.S. forces through the trans- and post-attack phases of any nuclear conflict. Reports to command centers of weapon effectiveness will be vital in managing strategic reserve forces and re-establishing a command structure. NDS data could be a major information component during negotiations to terminate a nuclear conflict.

3. COMPARISON WITH FY 1987 DESCRIPTIVE SUMMARY: (\$ in thousands)

RDT&E  
 Missile Procurement

EXPLANATION: (U) The increase of FY 1988 funds reflects a restructured program for the competitive development of NDS equipped GPS replenishment satellites slipped 24 months due to Shuttle shutdown.

4. OTHER APPROPRIATION FUNDS: (\$ in thousands)

Missile Procurement:  
 Funds  
 Quantities

5. RELATED ACTIVITIES: NDS sensors are flown on all Global Positioning System (GPS) satellites (PE 35165F) beginning with the NDS/GPS launch in July 1983. Development and production of the X-ray and optical NUDET sensors

Program Element: 31357F  
DOD Mission Area: 312 - General Defense Intelligence Programs

Title: NUDET Detection System (NDS)  
Budget Activity: 5 - Intelligence and Communications

for NDS are funded by the Department of Energy, [ PE 12433F develops and integrates the NDS electromagnetic pulse sensor into the GPS spacecraft, develops the ground/airborne user terminals, and produces the ground user terminals. Production of the airborne NDS terminals, to begin in FY 1991, will be funded in the Worldwide Airborne Command Post, PEs 11312F and 32015F.

6. WORK PERFORMED BY: System development and procurement is accomplished by Air Force System Command's Space Division, Los Angeles AFS, CA [ Rockwell International, Seal Beach, CA integrates NDS sensors on GPS satellites and produces the Electromagnetic Pulse (EMP) sensor. Ford Aerospace and Communications Corporation, Palo Alto, CA, and the Aerospace Corporation, El Segundo, CA, provide systems engineering support. Sandia National Laboratories, Albuquerque, NM, and Los Alamos National Laboratory, Los Alamos, NM, are under contract to the Department of Energy (DOE) to produce the X-ray and optical nuclear detonation detection sensors. Texas Instruments, Dallas, TX, is developing and will produce the user terminals. X-Systems, Garland, TX, is developing the EMP receiver/processor for the satellite.

7. (U) SINGLE PROJECT LESS THAN \$10 MILLION IN FY 1988 AND/OR FY 1989:

(U) Project: 31357F, NUDET Detection System

A. Project Description: The NDS payload consists of X-ray, optical, and electromagnetic pulse sensors on the operational eighteen satellite Navstar Global Positioning System (GPS) constellation. These sensors, when coupled with the extremely precise GPS timing capability, will provide location of nuclear bursts worldwide [

] This project integrates the X-ray and optical sensor packages into the GPS satellites. Nuclear detonation data are transmitted directly to NDS users. The data are also cross-linked to other GPS/NDS satellites which act as relay points. This cross-linking of information, when used with 18 satellites, will allow a user on one side of the earth to receive data on a detonation on the opposite side. It also provides multiple redundancy of the data transmission for increased system availability and survivability. A broad range of users (National Command Authorities, Strategic Air Command, Aerospace Defense Command, other Unified and Specified Commands, [ will receive NUDET data direct from the spacecraft on precise location, yield, count, time, and height of burst.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1986 Accomplishments: NDS Payloads were installed on the final four validation phase GPS spacecraft. The last development satellite was successfully launched in October 1985. The FY 1986 program continues integration engineering supporting the Department of Energy (DOE) provided NDS sensors on GPS production satellites.

(2) FY 1987 Program: On orbit support for the existing validation phase satellites will continue. Integration engineering support for the DOE provided sensors on the GPS production satellites will continue. [

Program Element: 31357F  
DOD Mission Area: 312 - General Defense Intelligence Programs

Title: NUDET Detection System (NDS)  
Budget Activity: 5 - Intelligence and Communications

(3) FY 1988 Planned Program and Basis for FY 1988 RDT&E Request: The FY 1988 program will continue to provide engineering support for on-orbit satellites. [and results will be used to develop second sources for key satellite payload boxes. These second sources will provide a foundation for competing the development and production of NDS equipped Global Positioning System (GPS) replenishment satellites. Costs for the NDS satellite sensor payload are based on previous NDS satellite sensor payload development efforts and are category II, mature, estimates.

(4) (U) FY 1989 Planned Program and Basis for FY 1989 RDT&E Request: The effort developing second sources for key NDS payload boxes will conclude. The development efforts for developing the NDS sensor payload equipped GPS replenishment satellites will begin. These satellites are required for launch in FY 1993 in order to maintain the NDS/GPS satellite constellation. This need date is consistent with the 24 month Shuttle standdown and DOD launch manifest (Shuttle and Delta II). The same cost estimate categories apply as in FY 1988.

(5) (U) Program to Completion: This is a continuing program. NDS design and production are keyed to the GPS schedule.

C. (U) Major Milestones:

<u>Milestones</u>	<u>Dates</u>
(1) (U) Defense Systems Acquisition Review Council II	June 1979
(2) (U) Begin Satellite Production	August 1982
(3) (U) Launch 1st GPS/NDS Spacecraft	July 1983
(4) (U) Launch 1st Operational Satellite	*(1st Quarter FY 1987) 1st Quarter FY 1989**
(5) (U) Achieve Worldwide 2-Dimensional NUDET Location Capability	*(1st Quarter FY 1988) 4th Quarter FY 1989**
(6) (U) Achieve Worldwide 3-Dimensional NUDET Location Capability	*(2nd Quarter FY 1989) 4th Quarter FY 1990**

\* Date presented in the FY 1987 Descriptive Summary.  
\*\* Launch dates and NDS capabilities are based on the Delta II contractor's proposal and the current DOD launch manifest.

(U) Explanation of Milestone Changes

(4) (5) (6) (U) First launch of an operational satellite and NDS operational capabilities slipped because of 24 month Shuttle standdown.

8. (U) PROJECTS OVER \$10 MILLION IN FY 1988 AND/OR FY 1989: Not Applicable

9. (U) COOPERATIVE AGREEMENTS: Not Applicable

PS: 31357F